337,132 COMPLETE SPECIFICATION

Fig. 1.

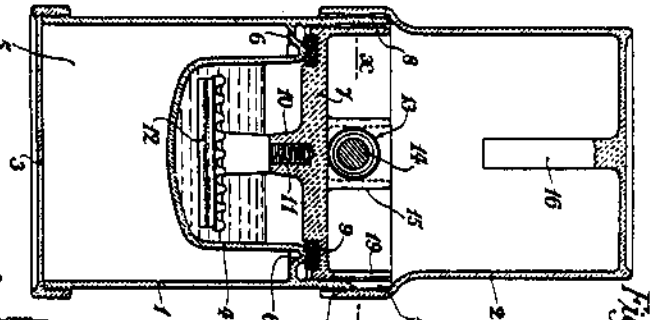


Fig. 2.

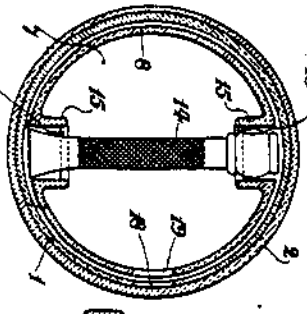


Fig. 3.

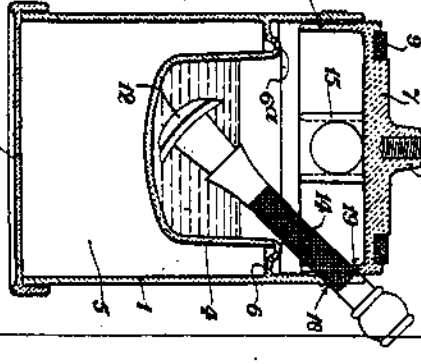


Fig. 6.

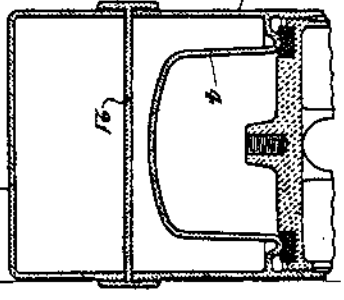


Fig. 5.

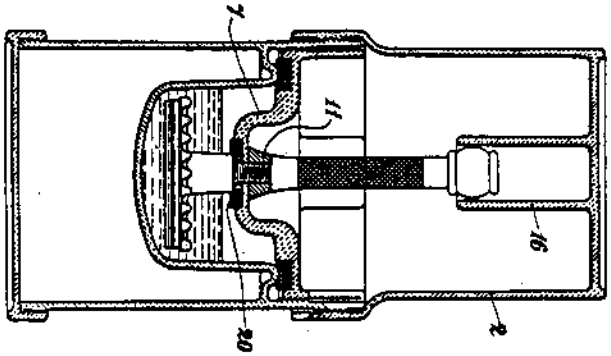
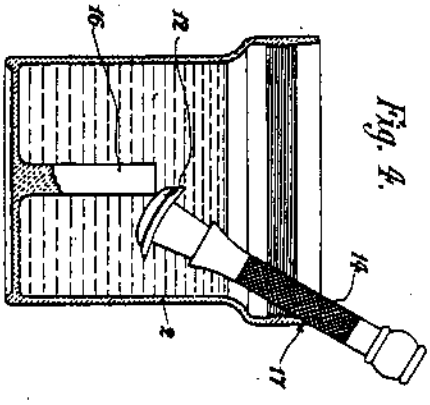


Fig. 4.



1 206 791

PATENT SPECIFICATION

(11) 1 206 791

DRAWINGS ATTACHED

(21) Application No. 43861/67 (22) Filed 26 Sept. 1967
(31) Convention Application No. 596 333 (32) Filed 22 Nov. 1966 in
(33) United States of America (US)
(45) Complete Specification published 30 Sept. 1970
(51) International Classification B 08 b 5/02
(52) Index at acceptance
A4F 12H

(54) IMPROVEMENTS IN OR RELATING TO THE CLEANING OF RAZORS

(71) We, SPERRY RAND CORPORATION, of 1290 Avenue of The Americas, New York, N.Y., 10019, United States of America, a corporation organized and existing under the laws of the State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the cleaning of razors and, more particularly, to the cleaning of electric razors.

Although electric razors have been in popular use for several decades, no satisfactory method of cleaning the operative heads of the razor after use has been developed. The several cleaning methods in general use have many disadvantages. Thus, cleaning by rubbing the inside of the razor head back and forth with a brush made of bristles entwined in a metal spine results in damage to the delicate elements of the head when the wire spine of the brush rubs against them. Also, when the brush direction is erversed, those bristles which are bent against the elements within the head must reverse the direction in which they are inclined; this brings them with considerable pressure against the shearing edges of the head elements, cutting the bristles and dulling the edges.

Cleaning by blowing often results in inhalation of undesirable hair clippings, since the user's mouth must be brought close to the razor head and the user naturally tends to suck air in just before, and after, blowing and several breaths are usually needed. Blowing also tends to deposit fine droplets of moisture from the breath on the shaver head; this can have an undesirable corrosive effect on the carbon steel of which the shearing elements may be made. Blowing is not very selective; some clippings are left on the razor while some are so scattered that they come to rest on the adjacent furniture. When shaving powder is used, as is customary particularly in hot humid weather, the particles of perspiration-laden powder caked up with the fine hair clippings are especially difficult to remove with one's moist breath.

Another method of cleaning is by tapping the electric razor sharply against a firm stationary object. This, however, removes only some of the hairs and other debris and increases the danger of breaking or distorting parts of the electric razor because of unduly violent or misdirected tapping.

There are, on the market, liquid preparations for cleaning electric razor heads. When such liquids are employed the user generally removes the head of the electric razor, for immersion in the liquid and agitates the head manually in the liquid, or in some cases immerses the head, still attached to the body of the razor, into the liquid and operates the razor during such immersion. These methods are cumbersome and do not give the head a thorough cleaning in a reasonable time.

Some electric razor heads are constructed of non-corrosive material and are specially designed so that they may be washed under a stream of hot water. Aside from inherent danger of electric shock, such cleaning is time consuming, since the razor should be dried after use. Also, this method of cleaning is not applicable to the most common types of electric razors, but requires more elaborate and expensive constructions to protect the electric razor from the water.

It is a primary object of this invention to provide an efficient and sanitary method for the cleaning of electric razor heads.

The invention provides a process for the cleaning of electric razor head components having finely cut hair particles thereon which comprises providing a quantity of a

[Price 5s. 0d. (25p)]

liquefied biocidal gas under pressure in a closed hand-held container, so venting said container to the atmosphere as to produce a concentrated jet consisting essentially of said gas, and directing said jet against said electric shaver head components to dislodge said particles.

Preferably the said biocidal gas consists of a mixture of a major proportion of a propellent having a boiling point in the range of about −70 to +10°C and a minor proportion of a fungicide. Advantageously, the propellant gas used includes one of the propellants customarily employed for aerosol sprays, such as a highly volatile, nontoxic fluorohydrocarbon or fluorochlorohydrocarbon. The fungicidal component gas is advantageously formaldehyde, which is both a fungicide and a bactericide and which is highly reactive with the proteins of bacteria and fungi. The pressurized container is desirably of a size which may be conveniently held in one hand, and is preferably like the usual commercial aerosol containers, in that its valve is so positioned that it may be readily operated by the thumb, or one finger, of the hand in which it is held. Also is is preferably unlike most aerosol containers, in that the outlet of the container is equipped with a small tube which serves to direct its output in a precise, narrow stream, and makes is possible to blow the debris from the shaver head accurately into a suitable container such as a wastebasket. Because of the thorough removal of foreign material, such as hair clippings or skin particles, by the method of this invention, the resistance encountered by the inner shearing member in its movement is reduced thus permitting the electric razor to operate at its maximum speed and with less heating; as a result, the user can obtain better and more comfortable shaves and avoid frequent repairs to the instrument.

The method of this invention also facilitates sales demonstrations of electric razors to large number of prospective purchasers, because it helps to prevent the buildup of bacteria and fungi on the razor head and the resulting transfer from one user to the next. In addition, by keeping down the accumulation of bacteria and fungi on the electric razor head, it decreases the danger of self-reinfection of the user and the danger of cross-infection when the razor is used by several members of the same family.

In the accompanying drawing, illustrating certain preferred devices for carrying out the process of the invention,

Fig. 1 is a side view illustrating the operation of the process.

Fig. 2 is a side view partly in cross-section illustrating one form of container,

Fig. 3 is a cross-sectional side view of the valve and tube of the container,

Fig. 4 is a side view, partly broken away to show a cross-section, of a particularly preferred form of container,

Fig. 5 is a cross-sectional view of the valve, taken along the line 5-5 of Fig. 4, and

Fig. 6 is a cross-sectional view of a portion of the valve taken along the line 6-6 of Fig. 5.

In the drawing, reference numeral 1 designates a cylindrical can containing a liquid 3 which may be a mixture of the propellant with a small amount of formaldehyde, the free space 5 above the top of the liquid being filled with a gaseous mixture of these ingredients. The can may be, for example, of sheet steel, about 2 to 3 inches in external diameter and about 5 to 8 inches in height. At the top of the can 1, there is a finger-operable valve 7, of the usual type, comprising a reciprocable valve stem 8, hollow at its upper end 9 and having a radial valve port 10 communicating with its interior, which stem 8 is pressed upward (by a spring 11 which is mounted within a hollow valve housing 12) to a position where its port 10 is sealed by an annular rubber seal 13. A hollow pushbutton 14 having a side port 15 is fixed atop the valve stem 8 so that when the button 14 is depressed, the valve stem port 10 is displaced from the rubber seal 13 permitting the gas to flow through the housing 12, port 10, stem 8, and pushbutton 14. Extending from the outlet port 15 is a thin tube 16 which may be force-fitted to, or integral with, the pushbutton 14; suitably the tube 16 is circular, with an internal diameter preferably in the range of about 1/100 to about 1/10 inch (e.g. about 1/50 inch) and an unobstructed length preferably in the range of about 1/16 to about 1-1/2 inch (e.g. 1/4 inch). The tube may, for example, be made of flexible (high pressure) polyethylene or other plastic. A cylindrical removable cap 17, advantageously of about the same external diameter as the can 1, is adapted to fit tightly over the valve 7 when the can is not in use, with the bottom 18 of the cap 17 frictionally engaging the outer portion of the can 1. The internal diameter of the cap 17 is sufficient to permit the tube 16 to be housed within the cap without displacement of said tube. The cap may be of sheet steel or other suitable material.

In the cleaning process, an electric razor 21 is held in one hand, preferably close to a suitable waste container for receiving the debris which is blasted away from the razor head during the process, while the can 1 is held in the other hand with the outlet of its tube 16 closely spaced from the head 22 of the razor, preferably, as shown in the drawing, after the usual removable razor

head guard element has been removed. The push button 14 is depressed to cause the release of gas from the can 1 and the evaporation into the free space 5 of a corresponding portion of the liquid. The parts are then moved relatively to each other so that the jet of gas emerging from the tube is directed against all parts of the head and, if desired, against the case of the electric shaver and the head guard thereof.

In accordance with a preferred feature of this invention, the blast of gas from the discharge tube of the device may contain materials, described more fully below, whose vapor pressure of the propellant. The embodiment shown in Figs. 4, 5 and 6, facilitates the transfer of these materials into the main stream of gas.

As shown in Figs. 4 and 5, the device includes a pushbutton-operated valve, indicated generally as 31, and a discharge tube 32. Unlike the device shown in Fig. 2, that of Figs. 4 to 6 has a dip tube 33 extending down from the hollow valve housing 34, into the liquid 36 in the container 37. This dip tube has a much smaller diameter (e.g. less than 0.1 inch, for example, 0.02 inch) than those generally used for dip tubes of aerosol containers employed for the dispensing of liquids. It is preferably a flexible polyethylene tube of uniform diameter press-fitted into a tubular extension 38 (Fig. 5) of the hollow valve housing 34 so that there is a clear passageway from the liquid 36 through the dip tube 33 and through the interior of the valve housing 34. Communicating with this passageway is an aperture 39 (which may be formed in the main portion of the valve housing 34), whose entrance is in the gas space 41 above the body of liquid in the can. This opening may, for example, be circular and of a diameter of about 0.04 inch.

The liquid 36 is principally composed of propellant, but it contains a small proportion of the less volatile materials which we wish to be present in the blast of gas. Since the gas phase, above the liquid in the container, is derived by evaporation of that liquid, the concentration of the less volatile materials in the gas phase is much lower than it is in the liquid phase, and may be practically zero. The less volatile materials are generally of a type which is normally non-gaseous; that is, they are liquid or solid at room temperature.

It is found that when the valve 31 is operated, the gas passing through the aperture 39 aspirates up a small quantity of the less volatile components, through the dip tube 33 thereby increasing the concentration of the less volatile materials in the gas blast leaving the discharge tube 32.

The valve housing 34 is supported (like the housing 12) by a crimped portion 42 of the sheet metal can top 43. The housing may be rigid plastic material such as polystyrene, for example.

The valve 31 carries a reciprocable valve stem 44 which operates in a manner similar to that of stem 8 in Fig. 3, being pressed upward by a spring 46 and having its ports sealed by an annular rubber seal 47, the stem and its ports being moved downwardly, to an unsealed position, when the push button is depressed. Like the stem 8, the stem 44 may be a unitary part, molded of rigid plastic, having an imperforate lower portion 48 and a tubular upper portion 49. Instead of a single port, the stem 44 has three generally rectangular ports 51 extending in an almost complete circle around the valve stem, the individual ports 51 being separated only by the lower portions of three thin vertical vanes 52 which integrally connect the upper and lower portions 48, 49. The large port area permits a freer discharge of gas when the valve is operated. The stem 44 also has an integral central upstanding projection 53 (within its tubular upper portion 49 and extending part way up from the level of the ports 51). The arrangement provides a desirable flow of gas through the portion 49.

In the device shown in Fig. 4, the discharge tube 32 and the push button 56 are both formed as portions of a one-piece molded adapter 57 which has a depending annular flange 58 shaped to be snapped over, and held by, an annular ridge 59 formed in the sheet metal top 43 of the container. The push button portion 56 fits over and is aligned with the upper end 49 of the valve stem 44 in such a manner that the hollow in the valve stem communicates with a central opening 61, in the portion 56, and thus to the interior of the discharge tube. The push button portion 56 is free of the main body of the adapter 57 except for an integral hinge-like connection therewith along a short line at 62, so that the push button portion 56 can be depressed slightly by the user, thus depressing the valve stem 44 and permitting the gas to pass through opening 61 and discharge tube 32. The adapter 57 is of suitable plastic (e.g. isotactic polypropylene) which can act as a hinge, as described.

In the device shown in Fig. 4, a plug 63 having a small central bore 64 (e.g. a circular bore 0.02 inch in diameter) is press-fitted into the end of the discharge tube 32 to give the precise, narrow gas stream previously mentioned. Also, the discharge tube is directed downwardly at an angle of, say, about 45-70° (e.g. 75°) to the vertical axis of the can, which makes it simpler for the user, holding the razor at a similar angle, to blow the clippings from the razor into a waste-basket or similar receptacle sup-

ported below the razor.

The propellant gas used is advantageously a highly volatile, non-toxic chlorofluorohydrocarbon such as dichlorodifluoromethane (F-12), trichloromonofluoromethane (F-11), or dichlorotetrafluoroethane (F-114 or F-114a). When dichlorodifluoromethane is employed, it may be blended with F-11, F-114 or F-114a to depress its vapor pressure. Other propellents may be employed, alone or in admixture with the chlorofluorohydrocarbon; for example, a blend of F-11 and propane may be used. Advantageously, the propellant, which dilutes the highly reactive formaldehyde and at the same time generates a sufficient pressure to provide a strong fine blast of the gas, constitutes the major portion, by weight, of the liquid 3. It is preferred to use propellants which have boiling points in the range of about −70 to +10°C. The amount of formaldehyde in the mixture need not be large; amounts well below 10% may be employed. Thus, while good results have been obtained with 6% formaldehyde, it is found that much smaller proportions, such as about 1%, or less, for example in the range of about 0.1 to 0.6% may be employed. When these smaller proportions are employed, the gas discharged during use has a fresh clean odor.

More suitably, a propellant such as F-12 is blended with monochlorodifluoromethane (F-22) using a proportion of less than 25% of the latter, best results being obtained with proportions of F-22 in the range of about 5 to 15%, most preferably about 10% (e.g. 90% F-12 and 10% F-22). The F-22 has a high vapour pressure, producing a higher pressure in the container and a desirable high blast velocity which is more effective for removal of hair clippings. When F-22 is used, the rubber sealing ring in contact with the valve stem should be of an oil-restant rubber, such as Neoprene (polychloroprene).

The liquid may be introduced into the can by filling the can with a mixture of the propellant and paraform or other solid polymer of formaldehyde and then capping the can with the valve and, while the valve is closed, heating the can to decompose the paraform and generate monomeric formaldehyde to produce a substantially anhydrous mixture of formaldehyde and the propellant. In one example, 6% of paraformaldehyde mixed with 94% of a blend of equal proportions of F-11 and F-12 was used. Trioxane may be employed together with, or in place of, paraformaldehyde.

The can may also be filled, under superatmospheric pressure, by injecting the constituents through the valve using any of the pressure-filling devices conventionally employed for filling of aerosol containers. Refrigeration may be employed during filling. Thus, the individual substantially anhydrous gases, liquefied by cooling to a low temperature below their boiling points, can be fed to the can or the mixture of gases maintained at a temperature below the boiling point of that mixture can be fed to the can, all while maintaining the can at a similar low temperature; this can be done, for example, under some pressure through the valve of the can or at atmospheric pressure before the can is capped with the valve.

In another filling method, particularly suitable for use in factories which also pack materials, such as foods, which may be affected by the presence of formaldehyde gas, the formaldehyde is supplied as an aqueous solution, preferably of relatively high concentration, e.g. above 35%, most preferably above 45%, for example 70%. When such aqueous solutions are employed with the preferred water-immiscible propellants, it is desirable to include a blending agent, e.g. ethanol, to promote even distribution of the formaldehyde in the propellant liquid. One suitable mixture contains 98.7% of a propellant which is a mixture of equal parts of F-11 and F-12, 0.5% formaldehyde, 0.4% ethanol and 0.4% water. It is often desirable to effectively remove the water from the liquid in the can by including therein a dehydrating agent, which may be of conventional type such as silica gel, in amount sufficient to take up the water present. Liquid anhydrous formaldehyde under pressure may be employed in this method.

While the invention has been specifically disclosed using formaldehyde as the biocidal gas, it will be understood that the use of other fungicidal or bactericidal gases, in place of, or in combination with, the formaldehyde is within the broad scope of this invention. Ethylene oxide is an example of such a gas. Advantageously, the components of the gas are non-corrosive to the materials of the razor head.

The use of a substantially anhydrous stream of gas is also advantageous in that it has a dehydrating effect on the debris on the razor head, making it less sticky and thereby facilitating its removal.

In the preferred method of the invention, the non-gaseous materials in the composition are of such nature, and present in such small amount, that the blast from the container forms substantially no liquid deposit on the razor head and there is no tendency for the cut hairs on the shaving surfaces of the razor to become anchored to these surfaces. In contrast, when one uses a device which sprays a liquid lubricant (e.g. an oily liquid) onto the shaving surfaces (forming a deposit thereon noticeable to the naked eye), the cut hairs tend to adhere to

these surfaces (possibly owing to surface tension of the liquid).

In a particularly preferred method of the invention, the liquid phase in the container comprises the propellant (preferably, as mentioned above, including a minor proportion of F-22), together with small proportions of: an essential oil, such as eucalptus oil; an alcohol such as isopropanol; a lubricant, such as magnesium stearate; and trioxane. The proportion of propellant is usually well above 95%, preferably above 99% of the liquid phase.

The essential oil gives the blast of gas a desirable fragrance and also has an antiseptic and fungicidal effect. The presence of the F-22, which has solvent properties, appears to enhance the vaporization of this oil. Other materials which may be used in place of, or in addition to, the oil of eucalptus are paradichlorobenzene and camphor. A typical proportion of essential oil is in the range of about 0.001% to 0.1% based on the total weight of the material charged to the container.

The isopropanol or similar alcohol has a bactericidal effect and is also found to increase the degree of vaporization of the essential oil. A typical proportion of this ingredient is in the range of about 0.001% to 0.1% based on the total weight of the material charged to the container.

The lubricant helps to lubricate the moving parts of the electric razor. I have found the solid, water-soluble metallic soap, magnesium stearate, to be particularly suitable for this purpose. It is non-reactive to the skin and, unlike the liquids commonly employed as lubricants for electric shavers, it gives a mild lubricating effect without causing the cut hairs to adhere to the razor. A typical proportion of this ingregient is in the range of about 0.01% to 1% based on the total weight of the material charged to the container. The metallic soap may be added as coarse solid particles, which dissolve or otherwise disperse in the propellant; the presence of the F-22 assists in dispersing this ingredient. A typical proportion of the F-22 is in the range of about 5% to 15% based on the total weight of the material charged to the container.

The trioxane, which may be similarly added to the other ingredients in solid form (e.g. as a powder), has an unusual effect. During the cleaning of the electric shaver by the blast of gas, the trioxane forms a visible white deposit on the part being blasted, which white deposit almost immediately sublimes (causing a volumetric expansion which helps to push the gas into all the corners and crevices). A typical proportion of this ingredient is in the range of about 0.1% to 1% based on the total weight of the material charged to the container.

A preferred typical charge, which fills about 1/2 to 2/3 the free volume of the container, has the following composition:

	Weight Ounces	% *Approx.*
Propellant, comprising 90% F-12 and 10% F-22	5.4	99.7
Magnesium stearate	$\frac{1}{600}$	0.03
Trioxane	$\frac{3}{200}$	0.3
Eucalyptus oil ($\frac{1}{100}$ cc)	$\frac{1}{3000}$	0.005
Isopropanol (technical 91%) ($\frac{1}{100}$ cc)	$\frac{1}{3000}$	0.005

As previously mentioned, the provision of the fine dip tube 33 and of the gas opening 39 causes a small amount of the relatively non-volatile components to be drawn up through the dip tube 33 and to be brought into contact, turbulently, with a large amount of propellant entering at the opening 39, causing thorough dispersion (including volatilization) in the gas stream of the small amounts (e.g. less than 1%) of these relatively non-volatile components. When the arrangement shown in Figs 2 and 3 (with no dip tube) is employed, it may take a relatively long time (on the order of several hours) for the concentration of the essential oil in the gas phase in the container to build up sufficiently to make its odor noticeable on re-use after the discharge of sufficient gas to clean a single electric razor head. With the arrangement shown in Figs. 5 and 6, the odor is maintained even on quick reuse (even without shaking of the container before each reuse). Another less preferred technique for effecting more rapid buildup of the concentration of the essential oil or other perfuming materials in the gas phase is the use of a small float (e.g. of balsawood or other suitable material of low density) impregnated, or otherwise treated, with the essential oil. This, in effect, provides a concentrated source of the essential oil in direct contact with the vapor space of the can. Still other less preferred techniques include the replacement of the long dip tube by a short tube at whose lower end is a small cup, which becomes wholly or partially filled with the liquid in

the container on shaking of the latter, or by a short tube at whose lower end is a porous solid material, such as a sponge or similar foam or other absorbing substance becomes saturated with the liquid on such shaking; the long dip tube may also be replaced by a long filament or wick leading from the liquid phase to a point adjacent the gas inlet of the valve housing.

The electric razors to be cleaned by the process of this invention are well known to the art. Uusally, such electric razors have a main body adapted to be held in the hand of the user and containing a suitable vibrator or other small electric motor, and a razor head which comprises one or more stationary outer members, each having a very thin shear plate with many slots or other openings in it to rest against the skin, and a corresponding number of inner members, each of which has many teeth or slots cooperating with the nether edges of the walls of said openings of the shear plate in a shearing action, the inner members being held up tightly against the inside surface of their respective shear plates by springs or other suitable means and being reciprocated or rotated very rapidly underneath the shear plates by the motor. The hairs of the face which penetrate the openings in the shear plates are thus sheared off by the motion of the inner members in cooperation with the nether edges of the walls of said openings. The widths of the slots are very small, usually less than 1/16 inch, e.g. about 1/32 inch.

In Fig. 1 of the drawing, the nozzle 16 is shown directing a fine concentrated blast at an electric shaver head whose shear plates and inner members are shaped like inverted channels, having flat slotted upper portions and integral depending parallel sides located in planes perpendicular to the plane of the upper portions, the blast being shown directed into the space just below said upper portions, where the cut hairs tend to accumulate. The construction and position of the tube 16 in relation to the can on which it is mounted is such as to permit the end of the tube to approach the head components very closely, within a fraction of an inch.

The autogenous pressure of the gases within the valved containers used in this invention will generally be less than about 200 psig, e.g. within the range of about 60 to 130 psig at 70°F.

It will be understood that while the invention has been illustrated for use with a household electric razor, it may also be used with other types of electric razors such as the electric hair clippers used by barbers and beauticians.

It is to be understood that the foregoing detailed description is given merely by way of illustration, and that variations may be made therein without departing from the scope of this invention as defined in the claims.

Our application No. 10910/70 (Serial No. 1206792) describes and claims a container and its contents for use in the cleaning of electric razor head components, said container containing under a superatmospheric pressure in the range of about 60 to 130 psig at 70°F a liquid mixture consisting essentially of a volatile propellant and a volatile fungicide, said container being of such a size that it can be held by hand, and said container having a finger operable valve whose intake is in the gas space above the surface of the liquid mixture and having an outlet connected to a narrow tube projecting laterally from the container, the tube being of such a length and diameter as to direct a fine concentrated jet of gas into the atmosphere when said valve is opened, whereby said container can be held by hand and the valve opened to direct said concentrated jet against said components to remove fine-cut hair particles therefrom.

WHAT WE CLAIM IS:—

1. A process for the cleaning of electric razor head components having finely cut hair particles thereon which comprises providing a quantity of a liquefied biocidal gas under pressure in a closed hand-held container, so venting said container to the atmosphere as to produce a concentrated jet consisting essentially of said gas, and directing said jet against said electric shaver head components to dislodge said particles.

2. A process as claimed in claim 1 wherein said biocidal gas consists of a mixture of a major proportion of a propellant having a boiling point in the range of about −70 to +10°C and a minor proportion of a fungicide.

3. A process as claimed in claim 2 wherein said fungicide is formaldehyde and said propellant is a fluorochlorohydrocarbon.

4. A process as claimed in claim 1 wherein the liquid is under an autogenous pressure in the range of about 60 to 130 psig at 70°F in said container the said gas being non-corrosive of said head component.

5. A process as claimed in any of the preceding claims wherein the gas carries trioxane.

6. A process as claimed in any of claims 1 to 4 wherein the gas carries magnesium stearate.

7. A process as claimed in claim 4 for the cleansing of razor head components having finely cut hair particules thereon which comprises providing a quantity of a liquid in a closed hand-held container, said liquid being under an autogenous pressure

in the range of about 60 to 200 psig in said container, there being a gas phase and a liquid phase in said container, so venting said container to the atmosphere as to produce a fine concentrated stream of the gas phase of the liquid, and directing said fine stream against said head component to dislodge said particles said gas being non-corrosive of said head component.

8. A process as claimed in claim 7 in which the pressure is about 60 to 130 psig and said liquid comprises about 5 to 15% of monochlorodifluoro methane.

9. A process as claimed in claim 8 in which said liquid contains a normally liquid perfuming agent.

10. A process as claimed in claim 8 in which said liquid comprises an essential oil.

11. A process as claimed in claim 7 in which the gas carries trioxane.

12. A process as claimed in claim 7 in which the gas carries a solid lubricant.

13. A process as claimed in claim 7 in which said liquid includes a normally non-gaseous component, said process including venting of the gas phase of the container to the atmosphere while forming within the container a stream of the gas being vented and while bringing the liquid phase in the container into close proximity to the latter stream whereby the fine stream of gas leaving said container includes a minor proportion, less than about 5%, of said non-gaseous component.

14. A process as claimed in claim 7 in which the amount of non-gaseous material in said fine stream is below about 5%.

15. A process for cleaning electric razors substantially as herein described.

CLEVELAND AND JOHNSON
Chancery House,
Chancery Lane,
London, W.C.2.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1970
Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.

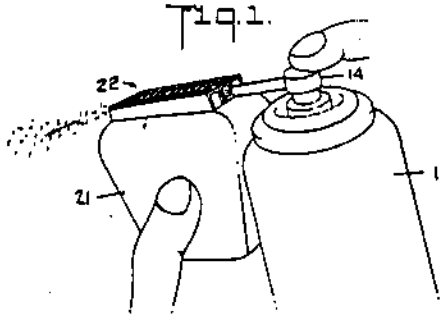
A45D 27/46A

1206791 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig.1.



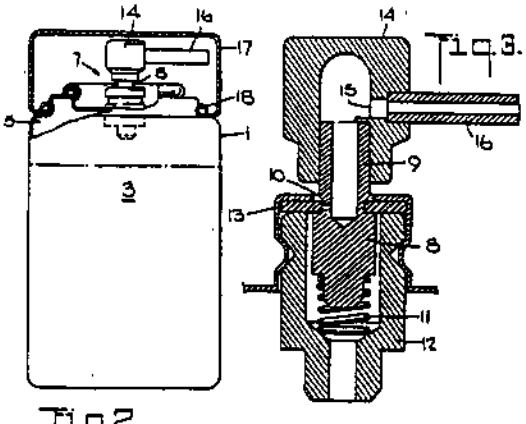


Fig.3.

Fig.2.

1206791 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

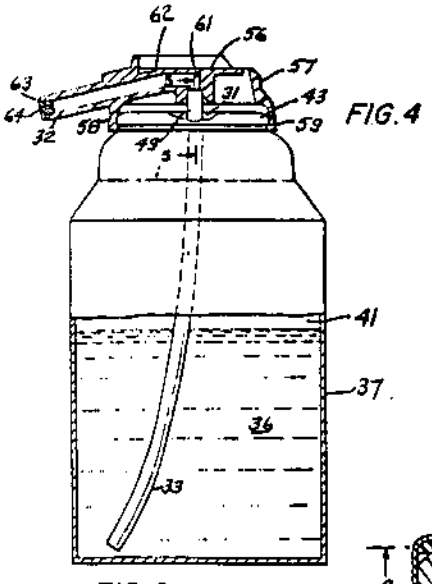


FIG. 4

FIG. 6

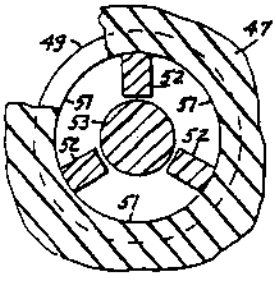
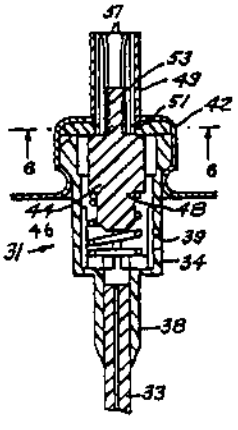


FIG. 5



1 206 792

PATENT SPECIFICATION

(11) 1 206 792

DRAWINGS ATTACHED

(21) Application No. 10910/70 (22) Filed 26 Sept. 1967
(62) Divided out of No. 1 206 791
(31) Convention Application No. 596 333
(32) Filed 22 Nov. 1966 in
(33) United States of America (US)
(45) Complete Specification published 30 Sept. 1970
(51) International Classification F 04 f 1/06
(52) Index at acceptance
F1R 3A3D 3B12
B2F 11B 2D 5B2Y 5D2B 5D3Y 5D5A 5D5C1B 5D5C2X

(54) DEVICE FOR CLEANING ELECTRIC RAZOR COMPONENTS

(71) We SPERRY RAND CORPORATION of 1290 Avenue of the Americas, New York, New York 10019, United States of America, a corporation organized and existing under the laws of the State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to devices for use in cleaning electric razor head components and for removing hair particles therefrom.

The invention consists in a container and its contents for use in the cleaning of electric razor head components said container containing under a superatmospheric pressure in the range of about 60 to 130 psig at 70°F a liquid mixture consisting essentially of a volatile propellant and a volatile fungicide, said container being of such a size that is can be held by hand and said container having a finger operable valve whose intake is in the gas space above the surface of the liquid mixture and having an outlet connected to a narrow tube projecting laterally from the container, the tube being of such a length and diameter as to direct a fine concentrated jet of gas into the atmosphere when the valve is opened, whereby the container can be held by hand and the valve opened to direct said concentrated jet against said components to remove fine cut hair particles therefrom.

The said superatmospheric pressure may be autogenous and the liquid mixture in the container have a boiling point in the range −70°C to +10°C and the construction of the container should be such as to withstand these pressures and temperatures. The container is preferably of cylindrical configuration and has a dimension of substantially 5 to 8 inches in height and a dimension of 2 to 3 inches in external diameter. The enclosed fungicide is preferably formaldehyde and the propellant a member of the group consisting of dichlorodifluoromethane, trichloromonofluoromethane and dichlorotetrafluoromethane.

Preferably, the finger operated valve is axially disposed in the top wall of the container and is biased to closed position, a push button is provided for operating the valve and the said narrow tube projects laterally below the top of the push button and a hollow cylindrical cap of sheet material fits over the top of the container and encloses the valve and tube, the tube terminating short of the inside of the cap.

The enclosed fungicide may be a normally non-gaseous component and the container may have means incorporated therein for increasing the concentration of the said component near the intake whereby the jet carries a minor amount of the non-gaseous component. Such concentration increasing means may comprise a dip tube leading from the intake to the liquid and the amount of the normally non-gaseous component be below about 1 per cent of the jet stream.

In order that the invention may be clearly understood and readily carried into effect the same will now be described with reference to the accompanying drawings in which:—

Figure 1 is a perspective external view of a container in accordance with the invention in operation.

Figure 2 is a side view partly in cross section of a container in accordance with the invention.

Figure 3 is a cross sectional side view of the valve and tube of the container.

Figure 4 is a side view partly broken away to show a cross section of a particularly preferred form of container.

Figure 5 is a cross sectional view taken on the line 5-5 of the valve of Figure 4.

Figure 6 is a cross sectional view taken

[Price 5s. 0d. (25p)]

on the line 6-6 of Figure 5.

In the drawing, reference numeral 1 designates a cylindrical can containing a liquid 3 which may be a mixture of the propellant with a small amount o fformaldehyde, the free space 5 above the top of the liquid being filled with a gaseous mixture of these ingredients. The can may be, for example, of sheet steel, about 2 to 3 inches in external diameter and about 5 to 8 inches in height. At the top of the can 1, there is a finger-operable valve 7, of the usual type, comprising a reciprocable valve stem 8, hollow at its upper end 9 and having a radial valve port 10 communicating with its interior, which stem 8 is pressed upward (by a spring 11 which is mounted within a hollow valve housing 12) to a position where its port 10 is sealed by an annular rubber seal 13. A hollow pushbutton 14 having a side port 15 is fixed atop the valve stem 8 so that when the button 14 is depressed, the valve stem port 10 is displaced from the rubber seal 13 permitting the gas to flow through the housing 12, port 10, stem 8, and pushbutton 14. Extending from the outlet port 15 is a thin tube 16 which may be force-fitted to, or integral with, the pushbutton 14; suitably the tube 16 is circular, with an internal diameter preferably in the range of about 1/100 to about 1/10 inch (e.g. about 1/50 inch) and an unobstructed length preferably in the range of about 1/16 to about 1-1/2 inch (e.g. 1/4 inch). The tube may, for example, be made of flexible (high pressure) polyethylene or other plastic. A cylindrical removable cap 17, advantageously of about the same external diameter as the can 1, is adapted to fit tightly over the valve 7 when the can is not in use, with the bottom 18 of the cap 17 frictionally engaging the outer portion of the can 1. The internal diameter of the cap 17 is sufficient to permit the tube 16 to be housed within the cap without displacement of said tube. The cap may be of sheet steel or other suitable material.

In the cleaning process, an electric razor 21 is held in one hand, preferably close to a suitable waste container for receiving the debris which is blasted away from the razor head during the process, while the can 1 is held in the other hand with the outlet of its tube 16 closely spaced from the head 22 of the razor, preferably, as shown in the drawing, after the usual removable razor head guard element has been removed. The push button 14 is depressed to cause the release of gas from the can 1 and the evaporation into the free space 5 of a corresponding portion of the liquid. The parts are then moved relatively to each other so that the jet of gas emerging from the tube is directed against all parts of the head and, if desired, against the case of the electric shaver and the head guard thereof.

In accordance with a preferred feature of this invention, the blast of gas from the discharge tube of the device may contain materials, described more fully below, whose vapor pressure is relatively low in comparison with the vapor pressure of the propellant. The embodiment shown in Figs. 4, 5 and 6, facilitates the transfer of these materials into the main stream of gas.

As shown in Figs. 4 and 5, the device includes a pushbutton-operated valve, indicated generally as 31, and a discharge tube 32. Unlike the device shown in Fig. 2, that of Figs. 4 to 6 has a dip tube 33 extending down from the hollow valve housing 34, into the liquid 36 in the container 37. This dip tube has a much smaller diameter (e.g. less than 0.1 inch, for example, 0.02 inch) than those generally used for dip tubes of aerosol containers employed for the dispensing of liquids. It is preferably a flexible polyethylene tube of uniform diameter press-fitted into a tubular extension 38 (Fig. 5) of the hollow valve housing 34 so that there is a clear passageway from the liquid 36 through the dip tube 33 and through the interior of the valve housing 34. Communicating with this passageway is an aperture 39 (which may be formed in the main portion of the valve housing 34), whose entrance is in the gas space 41 above the body of liquid in the can. This opening may, for example, be circular and of a diameter of about 0.04 inch.

The liquid 36 is principally composed of propellant, but it contains a small proportion of the less volatile materials which we wish to be present in the blast of gas. Since the gas phase, above the liquid in the container, is derived by evaporation of that liquid, the concentration of the less volatile materials in the gas phase is much lower than it is in the liquid phase, and may be practically zero. The less volatile materials are generally of a type which is normally non-gaseous; that is, they are liquid or solid at room temperature.

It is found that when the valve 31 is operated, the gas passing through the aperture 39 aspirates up a small quantity of the less volatile components, through the dip tube 33 thereby increasing the concentration of the less volatile materials in the gas blast leaving the discharge tube 32.

The valve housing 34 is supported (like the housing 12) by a crimped portion 42 of the sheet metal can top 43. The housing may be of rigid plastic material such as polystyrene, for example.

The valve 31 carries a reciprocable valve stem 44 which operates in a manner similar to that of stem 8 in Fig. 3, being pressed upward by a spring 46 and having its ports sealed by an annular rubber seal 47, the

stem and its ports being moved downwardly, to an unsealed position, when the push button is depressed. Like the stem 8, the stem 44 may be a unitary part, molded of rigid plastic, having an imperforate lower portion 48 and a tubular upper portion 49. Instead of a single port, the stem 44 has three generally rectangular ports 51 extending in an almost complete circle around the valve stem, the individual ports 51 being separated only by the lower portions of three thin vertical vanes 52 which integrally connect the upper and lower portions 48, 49. The large port area permits a freer discharge of gas when the valve is operated. The stem 44 also has an integral central upsatnding projection 53 (within its tubular upper portion 49 and extending part way up from the level of the ports 51). The arrangement provides a desirable flow of gas through the portion 49.

In the device shown in Fig. 4, the discharge tube 32 and the push button 56 are both formed as portions of a one-piece molded adapter 57 which has a depending annular flange 58 shaped to be snapped over, and held by, an annular ridge 59 formed in the sheet metal top 43 of the container. The push button portion 56 fits over and is aligned with the upper end 49 of the valve stem 44 in such a manner that the hollow in the valve stem communicates with a central opening 61, in the portion 56, and thus to the interior of the discharge tube. The push button portion 56 is free of the main body of the adapter 57 except for an integral hinge-like connection therewith along a short line at 62, so that the push button portion 56 can be depressed slightly by the user, thus depressing the valve stem 44 and permitting the gas to pass through opening 61 and discharge tube 32. The adapter 57 is of suitable plastic (e.g. isotactic polypropylene) which can act as a hinge, as described.

In the device shown in Fig. 4, a plug 63 having a small central bore 64 (e.g. a circular bore 0.02 inch in diameter) is press-fitted into the end of the discharge tube 32 to give the precise, narrow gas stream previously mentioned. Also, the discharge tube is directed downwardly at an angle of, say, about 45-70° (e.g. 75°) to the vertical axis of the can, which makes it simpler for the user, holding the razor at a similar angle, to blow the clippings from the razor into a waste-basket or similar receptacle supported below the razor.

The propellant gas used is advantageously a highly volatile, non-toxic chlorofluorohydrocarbon such as dichlorodifluoromethane (F - 12), trichloromonofluoromethane (F-11), or dichlorotetrafluoroethane (F-114 or F-114a). When dichlorodifluoromethane is employed, it may be blended with F-11, F-114 or F-114a to depress its vapor pressure. Other propellants may be employed, alone or in admixture with the chlorofluorohydrocarbon; for example, a blend of F-11 and propane may be used. Advantageously, the propellant, which dilutes the highly reactive formaldehyde and at the same time generates a sufficient pressure to provide a strong fine blast of the gas, constitutes the major portion, by weight, of the liquid 3. It is preferred to use propellants which have boiling points in the range of about −70 to +10°C. The amount of formaldehyde in the mixture need not be large; amounts well below 10% may be employed. Thus, while good results have been obtained with 6% formaldehyde, it is found that much smaller proportions, such as about 1%, or less, for example in the range of about 0.1 to 0.6% may be employed. When these smaller proportions are employed, the gas discharged during use has a fresh clean odor.

More suitably, a propellant such as F-12 is blended with monochlorodifluoromethane (F-22) using a proportion of less than 25% of the latter, best results being obtained with proportions of F-22 in the range of about 5 to 15%, most preferably about 10% (e.g. 90% F-12 and 10% F-22). The F-22 has a high vapor pressure, producing a higher pressure in the container and a desirable high blast velocity which is more effective for removal of hair clippings. When F-22 is used, the rubber sealing ring in contact with the valve stem should be of an oil-resistant rubber, such as Neoprene (polychloroprene).

The liquid may be introduced into the can by filling the can with a mixture of the propellant and paraform or other solid polymer of formaldehyde and then capping the can with the valve and, while the valve is closed, heating the can to decompose the paraform and generate monomeric formaldehyde to produce a substantially anhydrous mixture of formaldehyde and the propellant. In one example, 6% of paraformaldehyde mixed with 94% of a blend of equal proportions of F-11 and F-12 was used. Trioxane may be employed together with, or in place of, paraformaldehyde.

The can may also be filled, under superatmospheric pressure, by injecting the constituents through the valve using any of the pressure-filling devices conventionally employed for filling of aerosol containers. Refrigeration may be employed during filling. Thus, the individual substantially anhydrous gases, liquefied by cooling to a low temperature below their boiling points, can be fed to the can or the mixture of gases maintained at a temperature below the boiling point of that mixture can be fed to the can, all while maintaining the can at a

similar low temperature; this can be done, for example, under some pressure through the valve of the can or at atmospheric pressure before the can is capped with the valve.

In another filling method, particularly suitable for use in factories which also pack materials, such as foods, which may be affected by the presence of formaldehyde gas, the formaldehyde is supplied as an aqueous solution, preferably of relatively high concentration, e.g. above 35%, most preferably above 45%, for example 7%. When such aqueous solutions are employed with the preferred water-immiscible propellands, it is desirable to include a blending agent, e.g. ethanol, to promote even distribution of the formaldehyde in the propellant liquid. One suitable mixture contains 98.7% of a propellant which is a mixture of equal parts of F-11 and F-12, 0.5% formaldehyde, 0.4% ethanol and 0.4% water. It is often desirable to effectively remove the water from the liquid in the can by including therein a dehydrating agent, which may be of conventional type such as silica gel, in amount sufficient to take up the water present. Liquid anhydrous formaldehyde under pressure may be employed in this method.

While the invention has been specifically disclosed using formaldehyde as the biocidal gas, it will be understood that the use of other fungicidal or bactericidal gases, in place of, or in combination with, the formaldehyde is within the broad scope of this invention. Ethylene oxide is an example of such a gas. Advantageously, the components of the gas are non-corrosive to the materials of the razor head.

The use of a substantially anhydrous stream of gas is also advantageous in that it has a dehydrating effect on the debris on the razor head, making it less sticky and thereby facilitating its removal.

The non-gaseous materials in the composition are of such nature, and present in such small amount, that the blast from the container forms substantially no liquid deposit on the razor head and there is no tendency for the cut hairs on the shaving surfaces of the razor to become anchored to these surfaces. In contrast, when one uses a device which sprays a liquid lubricant (e.g. an oily liquid) onto the shaving surfaces (forming a deposit thereon noticeable to the naked eye), the cut hairs tend to adhere to these surfaces (possibly owing to surface tension of the liquid).

The liquid phase in the container comprises the propellant (preferably, as mentioned above, including a minor proportion of F-22), together with small proportions of: an essential oil, such as eucalyptus oil; an alcohol such as isopropanol; a lubricant, such as magnesium stearate; and trioxane. The proportion of propellant is usually well above 95%, preferably above 99% of the liquid phase.

The essential oil gives the blast of gas a desirable fragrance and also has an antiseptic and fungicidal effect. The presence of the F-22, which has solvent properties, appears to enhance the vaporization of this oil. Other materials which may be used in place of, or in addition to, the oil of eucalyptus are paradichlorobenzene and camphor. A typical proportion of essential oil is in the range of about 0.001% to 0.1% based on the total weight of the material charged to the container.

The isopropanol or similar alcohol has a bactericidal effect and is also found to increase the degree of vaporization of the essential oil. A typical proportion of this ingredient is in the range of about 0.001% to 0.1% based on the total weight of the material charged to the container.

The lubricant helpts to lubricate the moving parts of the electric razor. We have found the solid, water-insoluble metallic soap, magnesium stearate, to be particularly suitable for this purpose. It is non-reactive to the skin and, unlike the liquids commonly employed as lubricants for electric shavers, it gives a mild lubricating effect without causing the cut hairs to adhere to the razor. A typical proportion of this ingredient is in the range of about 0.01% to 1% based on the total weight of the material charged to the container. The metallic soap may be added as coarse solid particles, which dissolve or otherwise disperse in the propellant; the presence of the F-22 assists in dispersing this ingredient. A typical proportion of the F-22 is in the range of about 5% to 15% based on the total weight of the material charged to the container.

The trioxane, which may be similarly added to the other ingredients in solid form (e.g. as a powder), has an unusual effect. During the cleaning of the electric shaver by the blast of gas, the trioxane forms a visible white deposit on the part being blasted, which white deposit almost immediately sublimes (causing a volumetric expansion which helps to push the gas into all the corners and crevices). A typical proportion of this ingredient is in the range of about 0.1% to 1% based on the total weight of the material charged to the container.

A preferred typical charge, which fills about 1/2 to 2/3 the free volume of the container, has the following comopsition:

	Weight Ounces	% Approx.
Propellant, comprising 90% F-12 and 10% F-22	5.4	99.7
Magnesium stearate	1	0.03
	600	
Trioxane	3	0.3
	200	
Eucalyptus oil (1 / 100 cc)	1	0.005
	3000	
Isopropanol (technical 91%) (1 / 100 cc)	1	0.005
	3000	

As previously mentioned, the provision of the fine dip tube and of the gas opening 39 causes a small amount of the relatively non-volatile components to be drawn up through the dip tube 33 and to be brought into contact, turbulently, with a large amount of propellant entering at the opening 39, causing thorough dispersion (including volatilization) in the gas stream of the small amounts (e.g. less than 1%) of these relatively non-volatile components. When the arrangement shown in Figs. 2 and 3 (with no dip tube) is employed, it may take a relatively long time (on the order of several hours) for the concentration of the essential oil in the gas phase in the container to build up sufficiently to make its odour noticeable on re-use after the discharge of sufficient gas to clean a single electric razor head. With the arrangement shown in Figs. 5 and 6, the odor is maintained even on quick reuse (even without shaking of the container before each reuse). Another less preferred technique for effecting more rapid buildup of the concentration of the essential oil or other perfuming material in the gas phase is the use of a small float (e.g. of balsa-wood or other suitable material of low density) impregnated, or otherwise treated, with the essential oil. This, in effect, provides a concentrated source of the essential oil in direct contact with the vapor space of the can. Still other less preferred techniques include the replacement of the long dip tube by a short tube at whose lower end is a small cup, which becomes wholly or partially filled with the liquid in the container on shaking of the latter, or by a short tube at whose lower end is a porous solid material, such as a sponge or similar foam or other absorbing substance becomes saturated with the liquid on such shaking; the long dip tube may also be replaced by a long filament or wick leading from the liquid phase to a point adjacent the gas inlet of the valve housing.

The electric razors to be cleaned by the devices of this invention are well known to the art. Usually, such electric razors have a main body adapted to be held in the hand of the user and containing a suitable vibrator or other small electric motor, and a razor head which comprises one or more stationary outer members, each having a very thin shear plate with many slots or other openings in it to rest against the skin, and a corresponding number of inner members, each of which has many teeth or slots cooperating with the nether edges of the walls of said openings of the shear plate in a shearing action, the inner members being held up tightly against the inside surface of their respective shear plates by springs or other suitable means and being reciprocated or rotated very rapidly underneath the shear plates by the motor. The hairs of the face which penetrate the openings in the shear plates are thus sheared off by the motion of the inner members in cooperation with the nether edges of the walls of said openings. The widths of the slots are very small, usually less than 1/16 inch, e.g. about 1/32 inch.

In Fig. 1 of the drawing, the nozzle 16 is shown directing a fine concentrated blast at an electric shaver head whose shear plates and inner members are shaped like inverted channels, having flat slotted upper portions and integral depending parallel sides located in planes perpendicular to the plane of the upper portions, the blast being shown directed into the space just below said upper portions, where the cut hairs tend to accumulate. The construction and position of the tube 16 in relation to the can on which it is mounted is such as to permit the end of the tube to approach the head components very closely, within a fraction of an inch.

The autogenous pressure of the gases

within the valved containers used in this invention will generally be less than about 200 psig, e.g. within the range of about 60 to 130 psig at 70°F.

It will be understood that while the invention has been illustrated for use with a household electric razor, it may also be used with other types of electric razors such as the electric hair clippers used by barbers and beauticians.

Our co-pending application No. 43861/67 (Serial No. 1206791) claims a process for the cleaning of electric razor head components having finely cut hair particles thereon which comprises providing a quantity of a liquefied biocidal gas under pressure in a closed hand-held container, so venting said container to the atmosphere as to produce a concentrated jet consisting essentially of said gas, and directing said jet against said electric shaver head components to dislodge said particles.

WHAT WE CLAIM IS:—

1. A container and its contents for use in the cleaning of electric razor head components said container containing under a superatmospheric pressure in the range of about 60 to 130 psig at 70°F a liquid mixture consisting essentially of a volatile propellant and a volatile fungicide; said container being of such a size that it can be held by hand, and said container having a finger operable valve whose intake is in the gas space above the surface of the liquid mixture and having an outlet connected to a narrow tube projecting laterally from the container, the tube being of such a length and diameter as to direct a fine concentrated jet of gas into the atmosphere when the valve is opened, whereby the container can be held by hand and the valve opened to direct said concentrated jet against said components to remove fine cut hair particles therefrom.

2. A container and its contents as claimed in Claim 1 wherein the said pressure is autogenous and the said liquid mixture has a boiling point in the range −70° to +10°C.

3. A container and its contents as claimed in Claim 1 or Claim 2 of cylindrical configuration and having a height dimension of 5 to 8 inches and a diameter dimension of 2 to 3 inches.

4. A container and its contents as claimed in any of the preceding Claims wherein the fungicide is formaldehyde and the propellant is a member of the group consisting of dichlorodifluoromethane, trichloromonofluoromethane and dichlorotetrafluoromethane.

5. A container and its contents as claimed in any of the preceding Claims wherein the finger operable valve is axially disposed in the top wall of the container and is biased to closed position, a push button is provided for operating the valve, the said narrow tube projects laterally below the top of the push button and a hollow cylindrical cap of sheet material fits over the top of the said container and encloses said valve and said tube, the said tube terminating short of the inside of the said cap.

6. A container and its contents as claimed in claim 1 wherein the fungicide is a normally non-gaseous component and the said container has means for increasing the concentration of the said normally non-gaseous component adjacent the said intake whereby the said jet carries a minor amount of the said normally non-gaseous component.

7. A container and its contents as claimed in Claim 6 in which said concentration increasing means includes a dip tube leading from the said liquid to the said intake.

8. A container and its contents as claimed in claim 6 or claim 7 in which the amount of said normally non-gaseous component is below about 1% of said jet stream.

9. A container and its contents as claimed in claim 8 in which said normally non-gaseous component comprises a perfuming ingredient.

10. A container and its contents as claimed in claim 9 in which said normally non-gaseous component comprises oil of eucalyptus.

11. A container and its contents as claimed in claim 8 in which said normally non-gaseous component comprises a solid lubricant.

12. A container and its contents as claimed in claim 11 in which said normally non-gaseous component comprises a metallic soap.

13. A container and its contents as claimed in any of claims 6 to 8 in which said non-gaseous component comprises trioxane.

14. A container and its contents as claimed in claim 8 in which said normally non-gaseous component comprises isopropanol.

15. A container and its contents as claimed in claim 6 or claim 7 in which the liquid in said container comprises at least 99% of a propellant mxture of dichlorodifluoromethane and monochlorodifluoromethane in about 9:1 ratio, and also comprises eucalyptus oil, trioxane, isopropanol and magnesium stearate.

16. A container and its contents for use in cleaning electric razor head components substantially as herein described with reference to figures 1, 2 and 3 of the accompanying drawings.

17. A container and its contents for use

in cleaning electric razor head components substantially as herein described with reference to Figures 4, 5 and 6 of the accompanying drawings.

CLEVELAND AND JOHNSON,
Chancery House,
Chancery Lane,
London, W.C.2.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1970
Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.

1206792 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

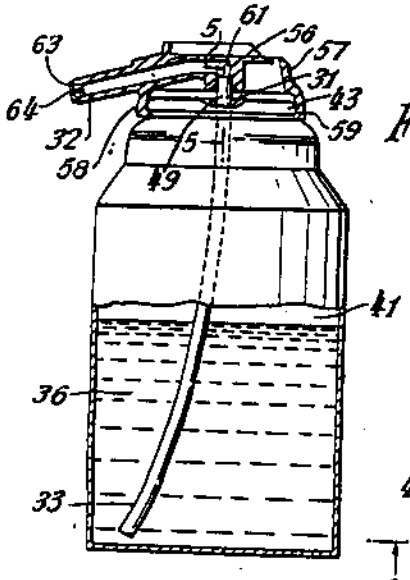


Fig.4.

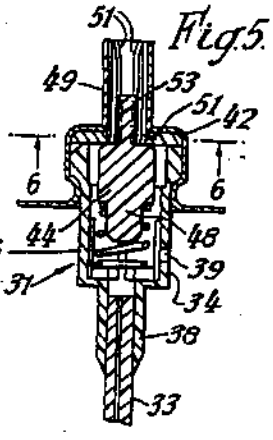


Fig.5.

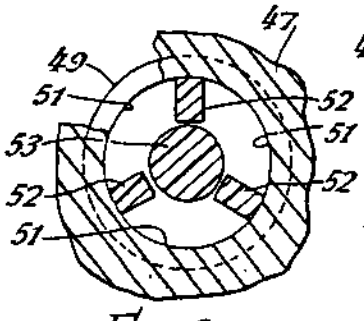


Fig.6.

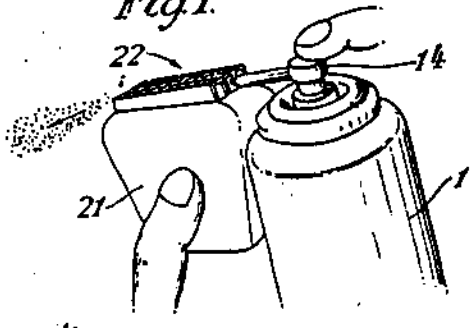
A41D 27/46A

Ex. in Dok.

1206792 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1.

Fig.1.



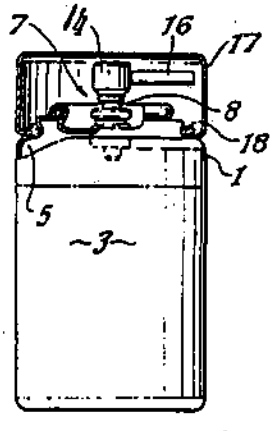
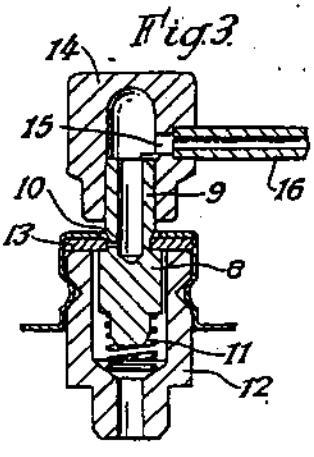
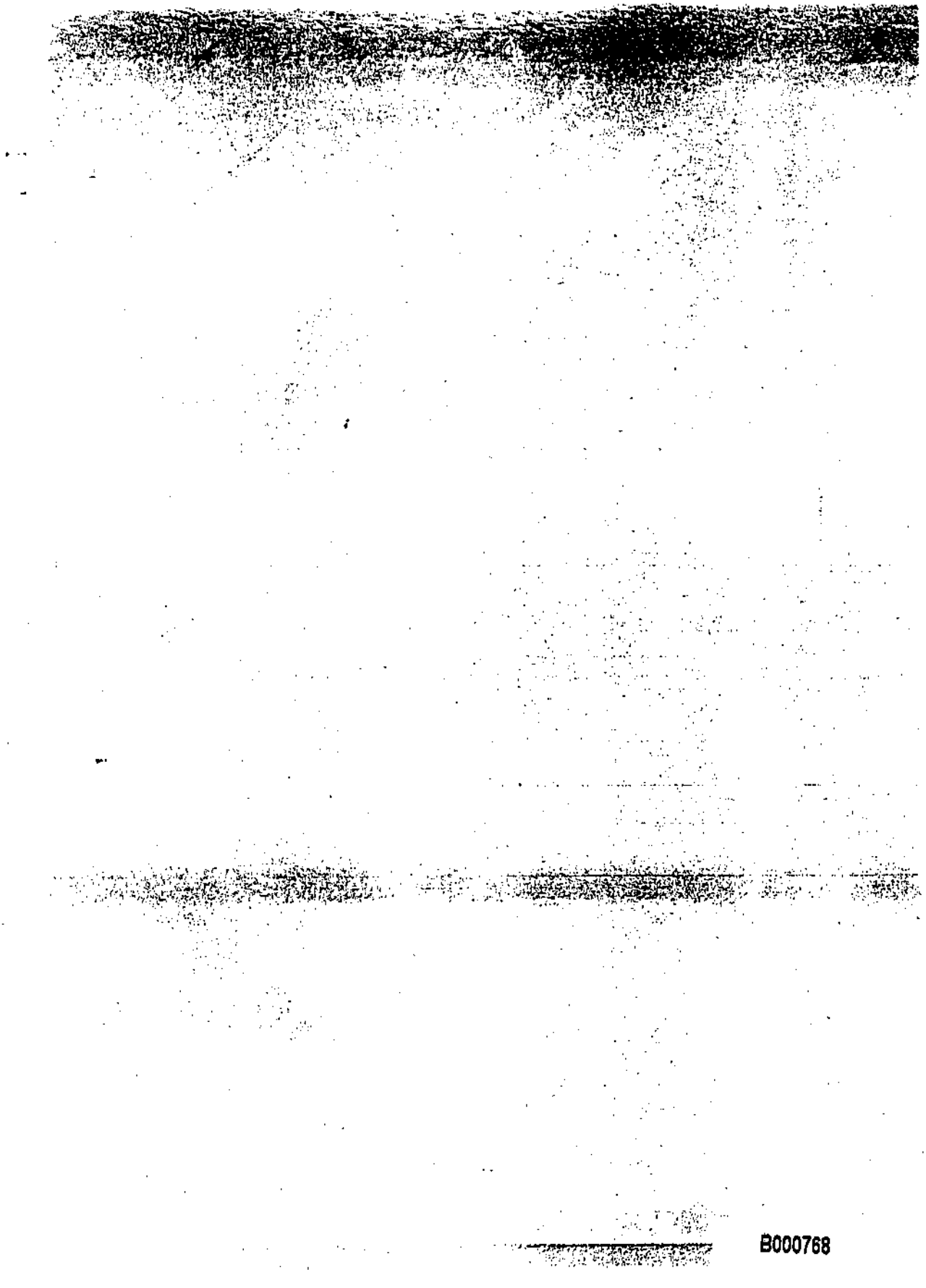


Fig.2.

Fig.3.





A45D 27/46A

(12) UK Patent Application (19) GB (11) 2 129 732 A

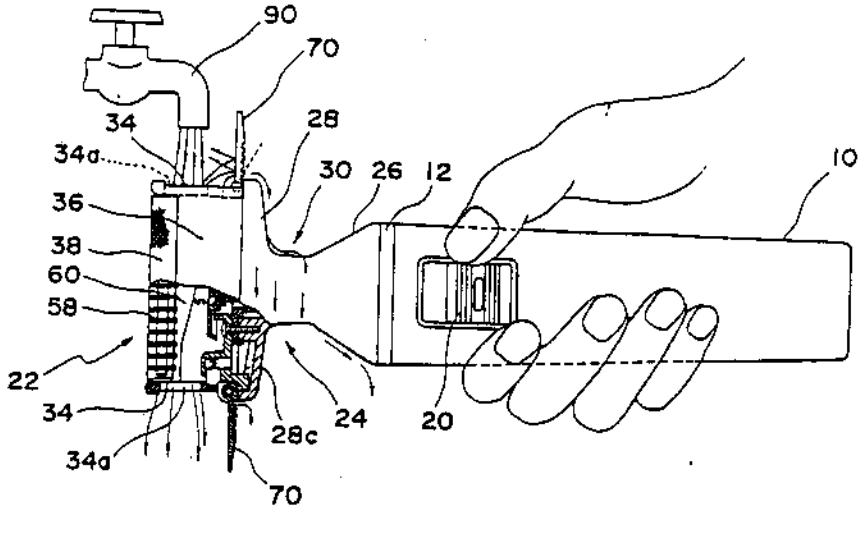
(21) Application No 8324830
(22) Date of filing 16 Sep 1983
(30) Priority data
(31) 57/170689
57/170690
57/171831
57/171832
57/171837
(32) 10 Nov 1982
10 Nov 1982
12 Nov 1982
12 Nov 1982
12 Nov 1982
(33) Japan (JP)
(43) Application published
23 May 1984
(51) INT CL³
A45D 27/46
B26B 19/10
(52) Domestic classification
B4B 40X8 41 42 43 44
(56) Documents cited
None
(58) Field of search
B4B

(71) Applicant
Kyushu Hitachi Maxell Ltd.,
(Japan),
4680 Oaza Igata,
Hojomachi,
Tagawa-gun,
Fukuoka-ken,
Japan.
(72) Inventors
Masahiko Ochiai,
Yoshinori Taito,
Toshiro Higa.
(74) Agent and/or Address for Service
Gill, Jennings & Every,
53-64 Chancery Lane,
London WC2A 1HN.

(54) Washable electric shaver

(57) A washable electric shaver comprises a water-tight housing (10) containing the shaver motor and having an on/off switch (20) mounted thereon, and a shaving head (22) fitted to one end of the housing. The shaving head (22) has a stationary perforated shear plate (38) and a movable shear element (58) which is arranged to be driven by the motor to oscillate in engagement with the inner surface of the stationary shear plate (38). Adjacent the opposite ends of the shear element (58) the shaving head has a pair of end openings (34a) which are normally closed by a pair of lateral closure flaps or lids (70). The closure flaps (70) are biassed towards the closed position, and a mechanism having an actuating member (78 Figure 2) is provided for opening the flaps simultaneously when desired. When the flaps (70) are open the shaver can be washed by allowing a flush of water to flow through the head (22) from one of the end openings (34a) to the other.

Fig. 12



GB 2 129 732 A

2129732

Fig. 1

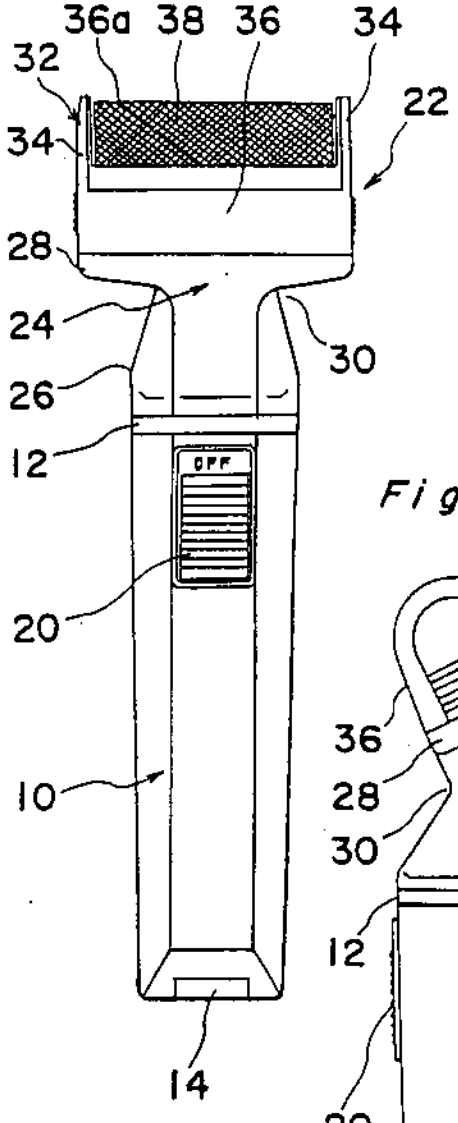


Fig. 2

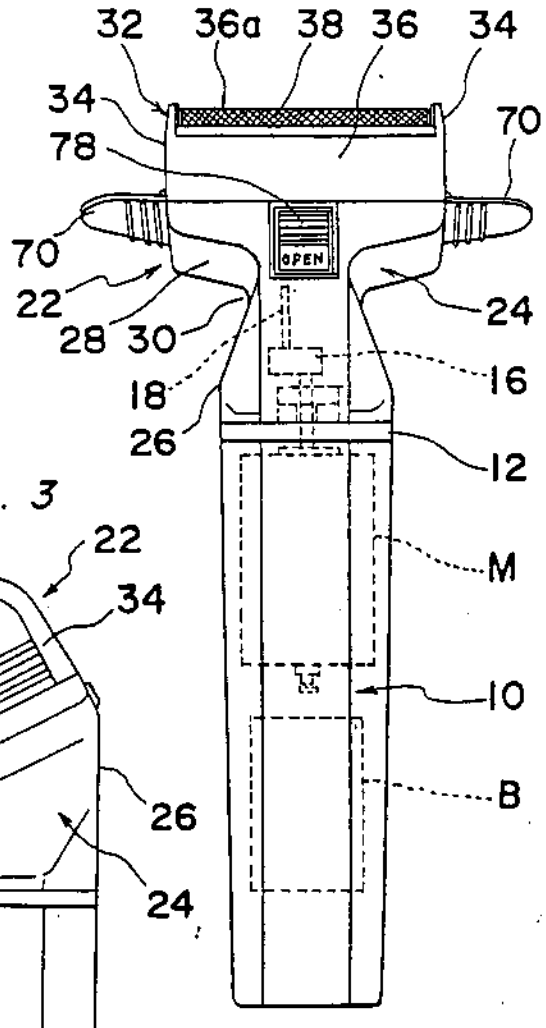
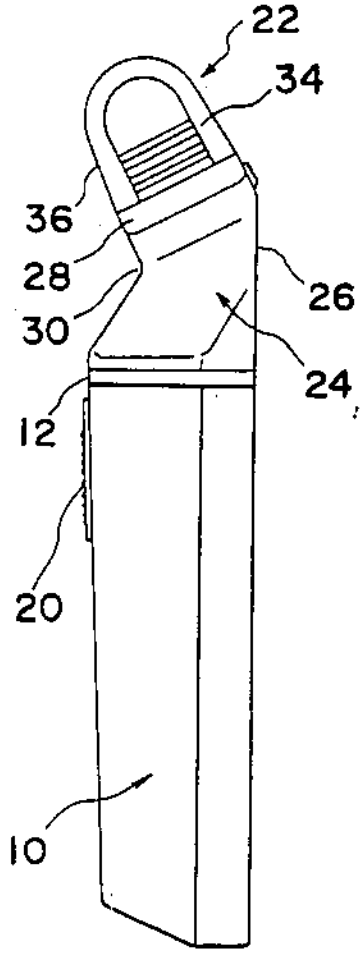


Fig. 3



2129732

Fig. 4

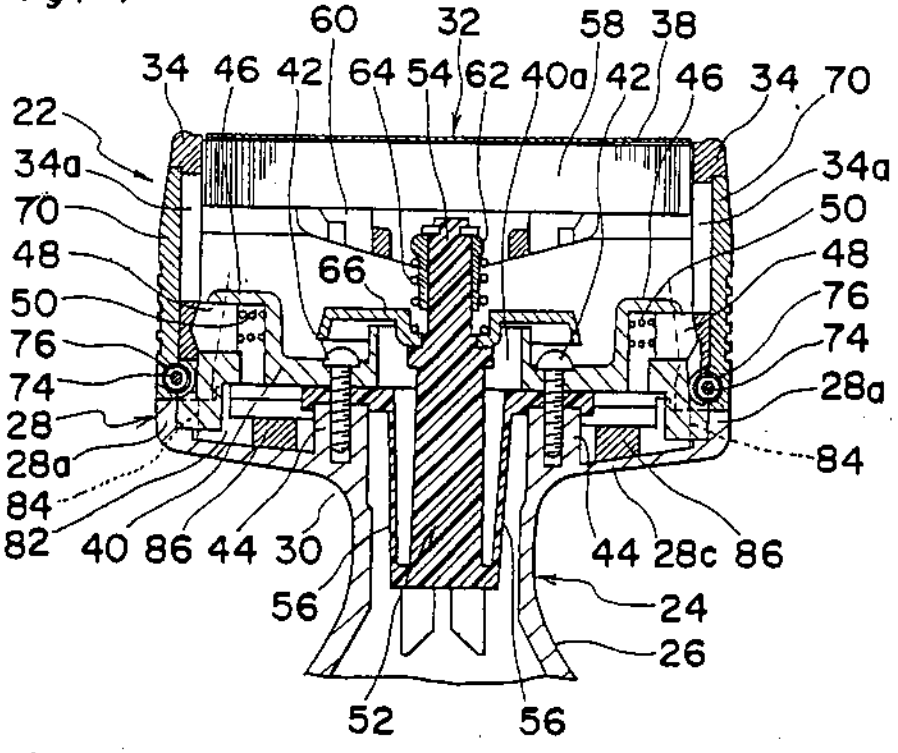
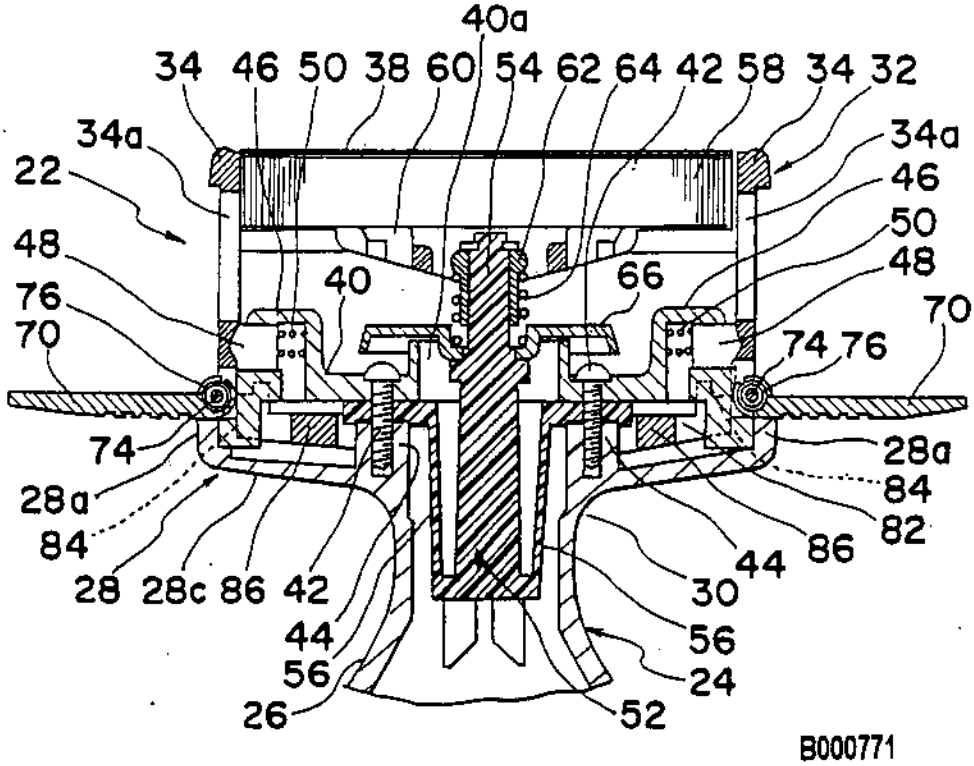


Fig. 5



2129732

Fig. 6

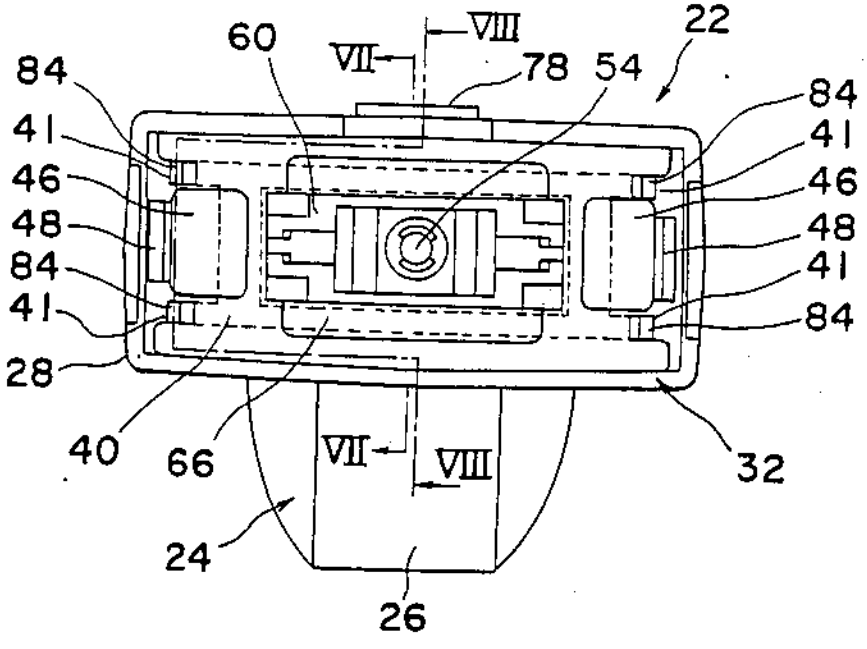


Fig. 7

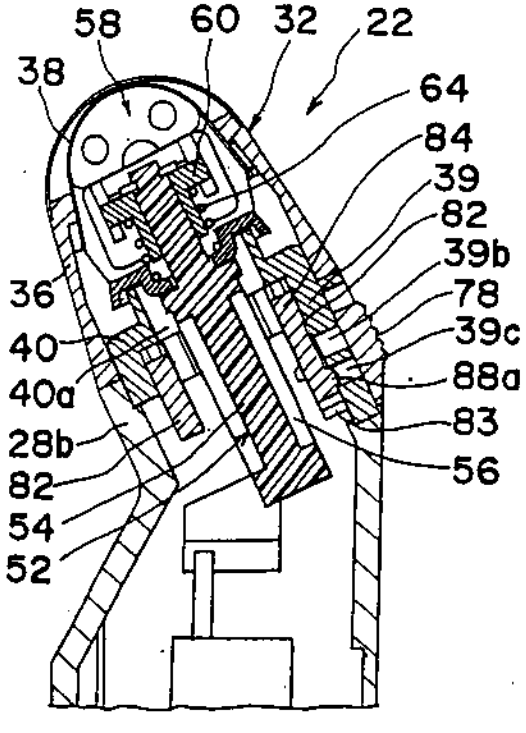
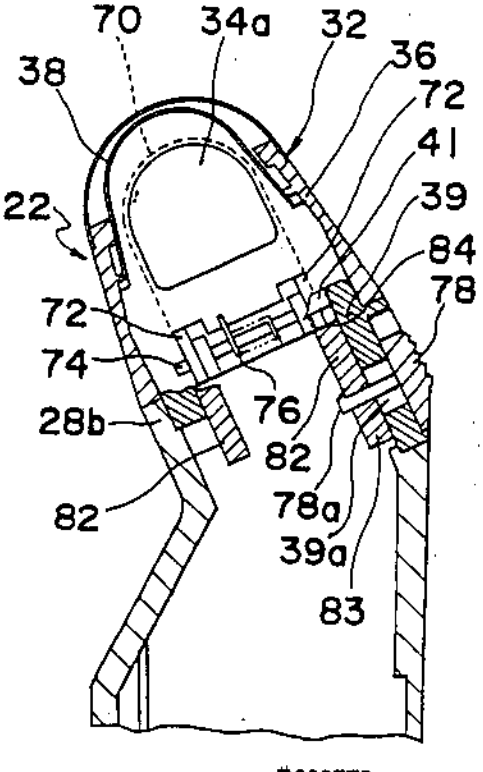


Fig. 8



2129732

Fig. 9

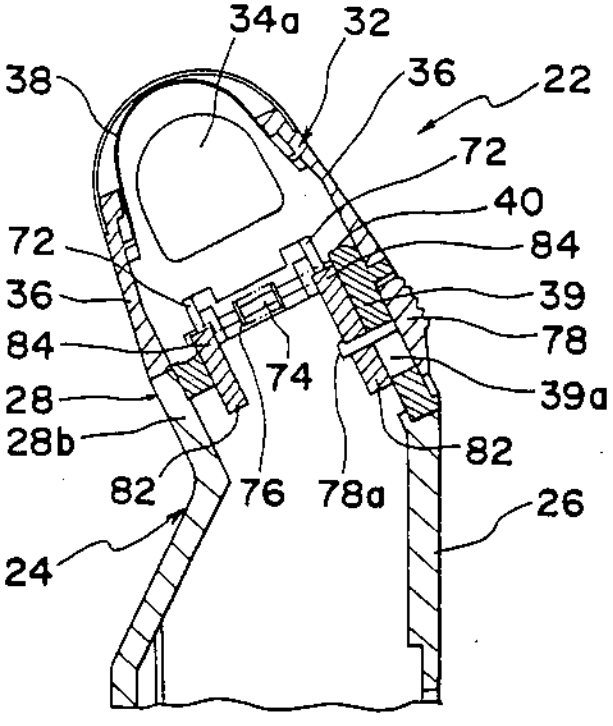


Fig. 10

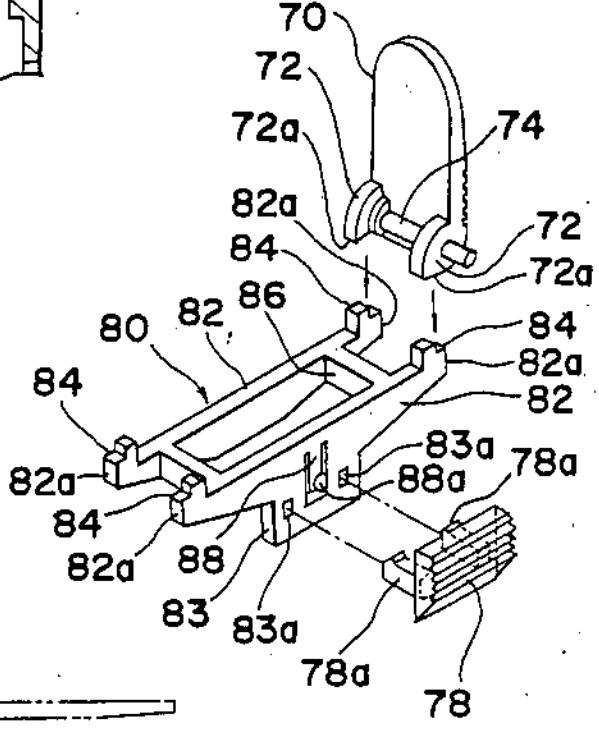
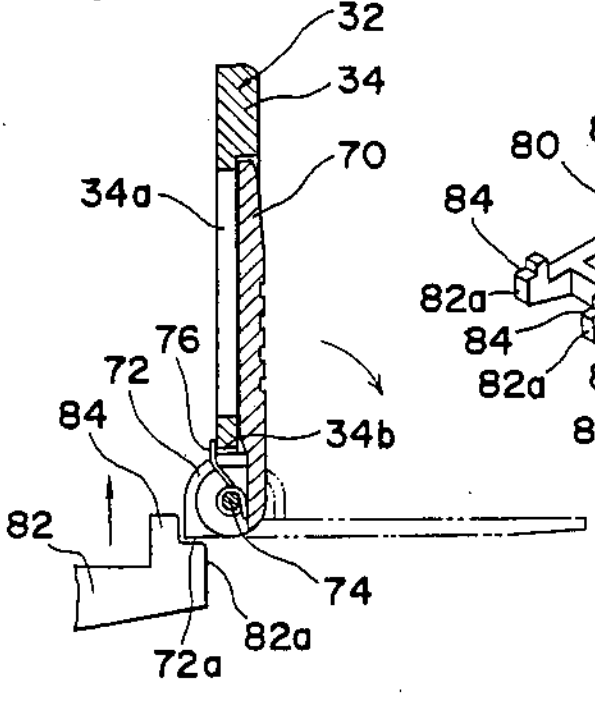
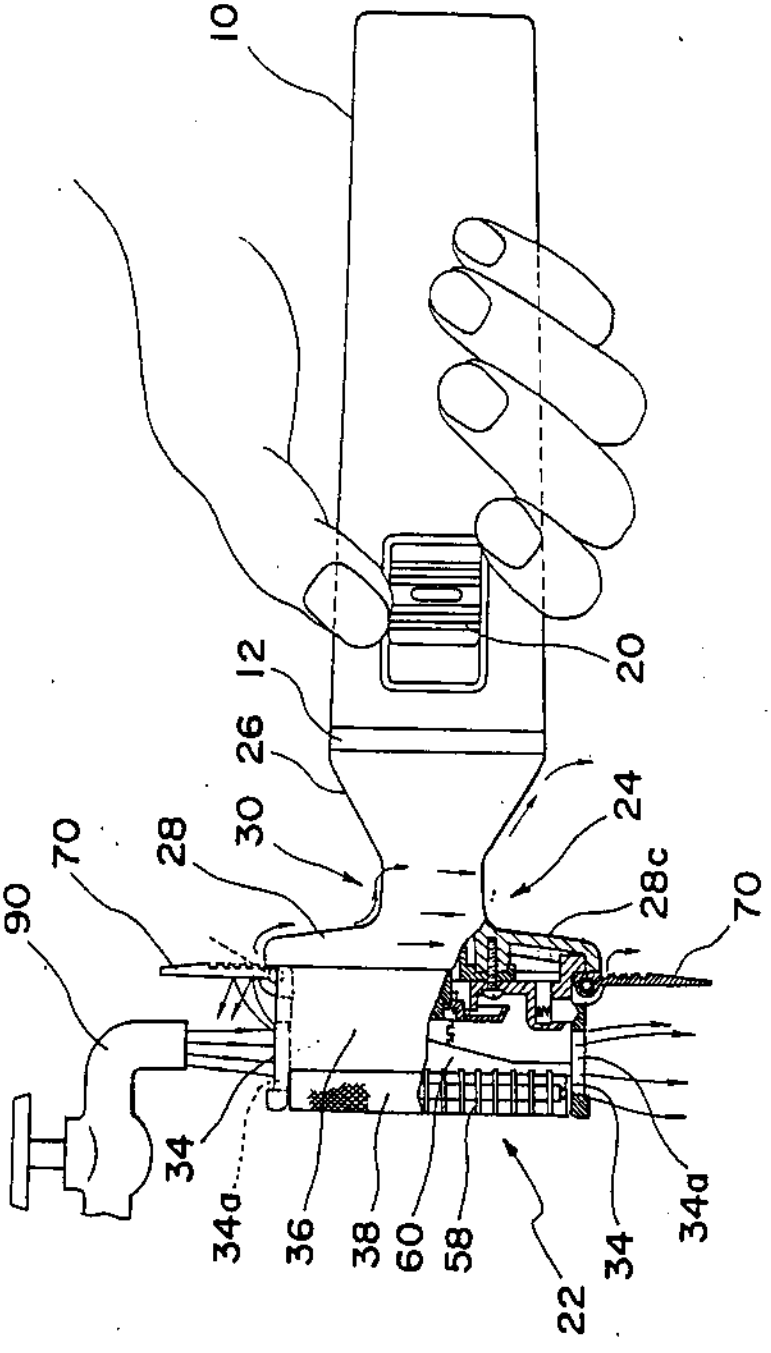


Fig. 11



2129732

Fig. 12



SPECIFICATION

Washable electric shaver

This invention relates to washable electric shavers which can be used for a wet shave or a dry shave as desired.

The washable electric shaver is a recent development and generally comprises, as is the case with conventional dry shavers, a shaving head having a stationary perforated shear plate, and a movable shear element which is driven by an electric motor and which cooperates with the stationary shear plate to cut hairs of a beard or a moustache projecting through the perforations in the shear plate. In general, washable electric shavers may be distinguished from the dry type by the employment of a water-tight structure in a housing for the electrical components, i.e. the motor, a battery source, an operating switch, and the connecting circuitry, and by the use of rust-resistant material for component parts of the shaving head.

The washable electric shaver is considered very convenient in that the clippings of hairs which accumulate inside the shaving head can readily be washed out. This is in contrast to the dry type of electric shaver which cannot be used for wet shaving and which requires occasional or regular cleaning of the shaving head with the aid of a brush to remove the clippings. Also, whereas it has been observed with dry electric shavers that hair clippings, when wetted by a fatty secretion from sweat glands in the human face, can become incrusted on the cutting edge or edges of the movable shear element so stubbornly as to require a relative strong brushing to remove them, the washable electric shaver is substantially free from this disadvantage when used for wet shaving. Specifically, when the washable electric shaver is used with soap or a shaving foam applied to the hairs to be cut, the secretion from the sweat glands is neutralised by the soap or the shaving foam and, therefore, the wetted hair clippings gathering around the cutting edge or edges of the movable shear element are readily removed when the shaving head is flushed with water or washed in a bowl of water in a manner similar to conventional wet razors.

However, the known washable electric shaver is still unsatisfactory in that difficulty is encountered in achieving a substantially complete cleaning of the shaving head with water, at least not without a complicated and time-consuming handling process. Furthermore, to keep a wet razor sharp so that a smooth and comfortable shave can be appreciated throughout, it is usually necessary to wash the razor with water to remove the hair clippings each time one or two draws of the razor have been made, and this is equally applicable to the washable electric shaver when used for wet shaving. However, in the case of the known washable electric shaver it is a disadvantage that water used to wash the shaving head and/or droplets of water remaining in the shaving head after the washing can flow downwards to wet the body of the shaver held by the hand of the user. Once the body of the shaver becomes wet, the user's grip on the shaver may be hampered by a tendency for slip to occur between the hand and the body of the shaver.

With the aim of providing a washable electric shaver which can be washed both easily and efficiently, according to the invention a washable electric shaver comprises an elongate water-tight housing serving as a hand-grip, a shaver motor mounted within the housing, an on/off switch having an operating element mounted on the housing for controlling an electrical power supply for driving the shaver motor, a shaving head having a generally T-shaped body mounted on one end of the housing so that the shaver as a whole has a generally T-shaped configuration, a cap which is removably mounted on the top of the T-shaped body and which has a stationary perforated shear plate replaceably carried thereby, a movable shear element which is mounted on the T-shaped body for movement in engagement with the inner surface of the stationary shear plate to cut hairs which, in use, project through the plate, and means which is arranged to be driven by the shaver motor to drive the movable shear element, a pair of end openings located at opposite ends of the cap and aligned with each other adjacent the opposite ends of the movable shear element, a pair of pivotally mounted closure flaps which are biassed to close the end openings, and a flap opening mechanism having an actuating element movable between an inoperative position in which the flaps are closed and an operative position in which the flaps, and thereby the end openings, are open.

A dry electric shaver is known, from Japanese Utility Model No. 45-9388, which has a shaving head provided with a pair of simultaneously pivotable lateral lids or flaps for selectively opening and closing a pair of lateral openings leading into the interior of the shaving head. The opening and closing of the lateral lids is effected by a mechanism which comprises a knob slidably mounted on the casing of the shaver, and a leaf spring having its opposite ends pivotally connected to the lateral lids and an intermediate portion secured to the knob. The leaf spring has a length substantially greater than the linear distance or span between the pivot points of the lateral lids so that a snap action of the leaf spring causes the lateral lids to pivot between two different positions to open or close the lateral openings depending on the direction in which the knob is moved. The specification states that, when and so long as the knob is in the position in which the lateral lids are open, a brush can be inserted into the interior of the shaving head through either of the lateral openings for the removal of the hair clippings, but there is no suggestion that the electric shaver can be washed with water.

The provision of the closure flaps at opposite ends of the cap of the shaving head in the washable electric shaver in accordance with the invention, and the facility to open these flaps when desired by simple manipulation of the actuating member, enables the interior of the shaving head to be washed quickly and thoroughly, and without the complicated procedure necessary with the known type of wash-

able electric shaver. Also, the shaver in accordance with the invention may have a relatively simple construction which is easy to manufacture.

Preferably, the T-shaped body of the shaving head has a hollow stem having one end so arranged that its exterior surface is continued from the exterior surface of the water-tight housing and having the other end formed integrally with a transverse bench which extends laterally outwardly therefrom in opposite directions and on which the cap is removably mounted. Preferably the transverse bench is tilted relative to the stem so that it faces forwards and upwards to present the stationary shear plate of the shaving head to the face of the user when the housing is held in a generally upright position.

The cap of the shaving head, with the stationary shear plate in position, preferably has a generally semi-circular cross-sectional profile so that the perforated shear plate, which may be of any suitable known construction, presents a curvilinear surface for contact with the skin during shaving. The movable shear element is preferably of a known construction having a plurality of juxtaposed blades cooperable with the stationary shear plate to cut hairs projecting therethrough when the movable shear element is linearly vibrated in a direction generally parallel to the longitudinal axis of the transverse bench and perpendicular to that of the shaver housing.

The closure flaps for the end openings in the cap may be pivotally mounted on either the cap or the transverse bench, but are preferably mounted on the cap to enhance the ease of fabrication and also to minimize the number of projections which may be exposed when the cap is removed from the transverse bench. The actuating element of the flap opening mechanism preferably comprises a slide knob which is mounted on the T-shaped body at a location adjacent the junction between the stem and the bench and facing generally away from the direction in which the bench is tilted, and which is slidable between the inoperative and operative positions in a direction generally perpendicular to the longitudinal axis of the transverse bench. Preferably the actuating element opens and closes the flaps by means of a rigid member having an intermediate portion coupled to the slide knob and the opposite ends thereof engageable with the closure flaps. Preferably, also, the flap opening mechanism includes a detent mechanism for holding the slide knob in its operative position and preventing it from automatically returning to the inoperative position under the influence of the biasing forces acting on the closure flaps if the slide knob is released. The slide knob must then be moved positively to the inoperative position to close the flaps.

The washing of the shaving head to remove hair clippings from the interior thereof is usually carried out with the flaps in the open position. At this time, the shaving head is washed either by shaking the shaving head in a pool of water or by flushing a stream of water through the head from one of the end openings to the other.

In accordance with another preferred feature of this invention, the T-shaped body of the shaving head is shaped so that it has a constricted region generally at the junction between the stem and the transverse bench to facilitate the drainage of water drops which would otherwise flow towards the hand-grip provided by the water-tight housing during or after washing the shaving head.

A preferred example of the washable electric shaver in accordance with the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a front elevation of the washable electric shaver;

Figure 2 is a rear elevation of the shaver, with the closure flaps of the shaving head in the open position;

Figure 3 is a side elevation of the shaver as shown in Figure 1;

Figure 4 is a sectional view, on an enlarged scale, of the shaving head of the shaver as shown in Figure 1, i.e. with the closure flaps closed;

Figure 5 is a view similar to that of Figure 4, but showing the closure flaps opened;

Figure 6 is a top plan view, on an enlarged scale, of the shaver head with the stationary shear plate and the movable shear element removed to show the interior of the head;

Figures 7 and *8* are cross-sections of the shaving head taken along the lines VII-VII and VIII-VIII respectively in Figure 6;

Figure 9 is a view similar to that of Figure 8, showing the slide knob of the flap opening mechanism moved to the position to open the flaps;

Figure 10 is an exploded view of the flap opening and closing mechanism, with only one of the flaps being shown;

Figure 11 is a sectional view, on a further enlarged scale showing the manner in which the lids are biassed closed and are opened; and,

Figure 12 is a front elevational view of the shaver, with a portion cut away, showing the shaver being washed with a flush of water coming from a water faucet.

Before the description of this invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings.

Referring first to Figures 1 to 3, a washable electric shaver according to this invention and shown therein is of a generally two-component structure comprising an elongated water-tight housing 10, which serves concurrently as a grip for the holding by the hand of a user, and a shaving head 22. The housing 10 has one end closed by an end plate 12 in any suitable manner, but in any event in a water-tight fashion, and the other end closed by an end wall which may be either a separate member or an integral part of the housing 10. Preferably, the end wall at the other end of the housing 10 is formed with a recess 14 in which a pair of plug pins (not shown) for removable connection with an external electric power supply line (not shown) are exposed. As a matter of course, these plug pins are situated within the recess 14 in the form as extending in a water-tight fashion through the end wall.

The housing 10 accommodates therein a micromotor M having its drive shaft extending through the end plate 12 rotatably, but in a water-tight fashion, the tip of which drive shaft has an eccentric flywheel 16 mounted thereon for rotation together therewith. The flywheel 16, capable of undergoing an eccentric rotation relative to the drive shaft of the motor M during the rotation of the latter, carries a drive pin 18 having one end rigidly secured thereto so as to extend in a direction opposite to and parallel to the drive shaft of the motor M, but in axially offset relation to the drive shaft of the motor M.

The housing 10 has a slide 20 mounted exteriorly thereon for movement between on and off positions in a direction preferably parallel to the longitudinal sense thereof for controlling a power supply control switch (not shown) for initiating and interrupting the supply of an electric power to the motor M when the slide 20 is moved to the on position and the off position, respectively. The housing 10 may accommodate a battery source B therein, preferably a rechargeable battery, and an electric circuit associated with the electric component parts accommodated inside the housing 10.

Referring still to Figures 1 to 3, the shaving head 22 comprises a generally T-shaped body 24 constituted by a hollow stem 26 having one end mounted on the end plate 12 by means of either a screw mounting or a bayonet mounting so as to cover both the eccentric flywheel 16 and the drive pin 18, and a transverse bench 28 integral with the stem 26 and protruding laterally outwards from the other end of the stem 26 in a direction generally perpendicular to the longitudinal sense of the housing 10 as best seen from Figures 1 and 2. As best shown in Figure 3, the stem 26, except for a rear portion thereof which comes rearwardly of the slide 20, i.e., which is situated on one side of the shaver circumferentially opposite to the slide 20, is generally tapered inwardly, or is so shaped as to converge in a direction, towards the transverse bench 28 so as to define a constricted area 30 generally at the junction between the stem 26 and the transverse bench 28. In addition, the transverse bench 28 integral with the stem 26 is so molded together with the stem 26 and so shaped as to tilt a certain angle relative to a plane perpendicular to the longitudinal sense of the housing 10 or the shaver body in a direction substantially frontwardly of the slide 20 as viewed in Figure 3.

In other words, the head body 24 of one-piece construction including the stem 26 and the transverse bench 28 is molded to such a shape that the shaving head 22 is tilted forwards at a certain angle relative to the elongated housing 10 so that, during the shaving of the hairs, it can incidentally lean against the skin even when the housing 10 held in the hand of the user is generally positioned upright.

The shaving head 22 also comprises a cap 32 of a shape generally similar to the inverted shape of a figure "U" comprised of a pair of opposite end walls 34 of a generally inverted U-shape and a wall 36 of a generally inverted U-shape having its opposite U-shaped lateral edges continued to the U-shaped peripheral edge portions of the respective end walls 34. The end walls 34 have end openings 34a (Figures 4 and 5) defined therein, respectively, each being of a shape similar to the shape of any one of the end walls 34, and the wall 36 also has a shaving opening 36a defined therein at a location corresponding to the bottom of the shape of the figure "U" and extending between the end walls 34. A flexible stationary shear plate 38 having a multiplicity of fine perforations defined therein in a predetermined or desired pattern is replaceably mounted on the cap 32 in any known manner so as to cover the shaving opening 36a, said stationary shear plate 38 being so bent as to follow the contour of the U-shaped peripheral edge portions of the respective end walls 34.

Hereinafter, an internal mechanism of the shaving head 22 will be described with particular reference to Figures 4 to 11. As can readily be understood from Figures 4 to 9, the transverse bench 28 is, when generally viewed from top, rectangular in shape, having a pair of opposite end walls 28a, a pair of opposite side walls 28b and a bottom wall 28c, said walls 28a and 28b being continued to and integral with the stem 26 through the bottom wall 28c, and said bottom wall 28c being discontinued by a bottom opening which is defined therein in communication with the hollow of the stem 26.

Referring still to Figures 4 to 9, the transverse bench 28, essentially in the form of a receptacle, is closed by a rectangular cover plate 40 to form a generally flattened space therebetween. This cover plate 40 is secured by means of set screws 42 to a pair of spaced projections 44 integral with and protruding outwards from the bottom wall 28c in a direction away from the stem 26, and has a central aperture 40a defined therein, and also a pair of opposite hollow bearing projections 46 located adjacent the opposite ends thereof and protruding therefrom at right angles in a direction away from the stem 26. The bearing projections 46 carry detent pieces 48, respectively, which detent pieces 48 are collapsibly supported thereby, but are normally biased by associated springs 50 within the bearing projections 46 so as to project laterally outwardly therefrom in the opposite directions away from each other for engagement into corresponding detent recesses, defined in the interior surfaces of the respective end walls 34 of the cap 32 to hold the cap 32 in the form as mounted on the transverse bench 28. Thus, it will readily be seen that the cap 32 with the stationary shear plate 38 thereon can be removed from the transverse bench 28 merely by pulling it outwards in a direction generally perpendicular to the bench 28 thereby allowing the detent pieces 48 to be temporarily collapsed inwardly of the respective projections 46 against the springs 50 to let the end walls 34 pass over the detent pieces 48.

Extending loosely through the central opening 40a in the cover plate 40 and also through the bottom opening in the bottom wall 28c of the transverse bench 28 is an oscillating carriage 52 operatively coupled to the drive pin 18 (Figure 2) for the oscillatory motion in a direction generally perpendicular thereto and parallel to the longitudinal sense of the transverse bench 28. The oscillating carriage 52 includes a post 54 having one end situated within the

hollow of the head body 24 and formed integrally with a pair of opposite flexible arms 56 which extend axially inwardly thereof towards the other end of the post 54 generally in parallel relation to each other, the free ends of said arms 56 being firmly clamped between the projections 44 and the cover plate 40 with the set screws 42 passing therethrough as best shown in Figures 4 and 5. With the oscillating carriage 52 so supported, the drive pin 18 (Figure 3) projects axially inwards into the post 54 wherefore, during the eccentric rotation of the flywheel 16 as a result of the rotation of the motor M, the post 54 can be oscillated in a direction generally perpendicular thereto and parallel to the longitudinal sense of the transverse bench 28. The other end of the post 54, situated within the cap 32, has a generally elongated movable shear element 58 yieldingly mounted thereon through a holder 60 of any known construction in a known manner. More specifically, the holder 60 having the movable shear element 58 replaceably mounted thereon has a bushing 62 supported thereby for pivotal movement in a plane parallel to the lengthwise direction of the movable shear element 58 and is carried by the oscillating carriage 52 with the bushing 62 mounted axially non-movably on the other end of the post 54.

The movable shear element 58, comprised of a plurality of closely juxtaposed blades as is well known to those skilled in the art, is normally biased so as to contact the stationary shear plate 38 by a compression spring 64 interposed between the bushing 62 and a closure plate 66. The closure plate 66 is mounted on the post 54 for oscillatory movement together therewith and is used to close the central opening 40a in the cover plate 40 to prevent the clippings of the hairs from falling into the hollow of the stem 26 therethrough and then through the bottom opening in the transverse bench 28.

In the construction so far described, it will readily be seen that, during the rotation of the motor, the movable shear element 58 can be oscillated relative to the stationary shear plate 38 in a direction transversely of the drive pin 18 then undergoing an eccentric motion together with the eccentric flywheel 16, cooperating with the stationary shear plate 38 to cut hairs which have projected through the fine perforations in the stationary shear plate 38 for engagement by the movable shear element 58. In any event, the manner by which both of the stationary and movable shear elements 38 and 58 are supported relative to each other may not be limited to those described and illustrated, but may be of any known construction.

In accordance with a feature of this invention, the shaving head 22 further comprises a pair of lateral lids, generally identified by 70, for selectively closing and opening the end openings 34a in the cap 32. So far illustrated the lateral lids 70 are pivotally carried by the cap in a manner which will now be described with particular reference to Figures 8 to 11. However, it is to be noted that, since the lateral lids 70 are supported by the respective end walls 34 of the cap 32 in the same manner, reference will be made to only one of the lateral lids 70 for the sake of brevity.

Referring now to Figures 8 to 11, and as best shown in Figure 10, the lateral lid 70 is generally similar in shape to the shape of the respective end wall 34 of the cap 32 where the associated end opening 34a is defined, but is of a size sufficient to completely cover the end opening 34a. This lateral lid 70 has one end generally rounded and the other end formed integrally with a pair of spaced bearing flanges 72 of a generally sector-shaped configuration protruding outwardly therefrom in a direction at right angle to the body of the lateral lid 70. The lateral lid 70 has a shaft 74 rotatably extending through the bearing flanges 72 with its opposite ends situated exteriorly thereof and secured to the associated end wall 34. The securement of the opposite ends of the shaft 74 to the associated end wall 34 may be carried out by pressure-fitting them into correspondingly spaced recesses (not shown) defined in one surface of the associated end wall 34 facing the interior of the cap 32, or in any suitable manner readily conceivable to those skilled in the art. It is to be noted that, with the lateral lid 70 so supported, the bearing flanges 72 project into the interior of the cap 32 through a cutout area defined at 34b, as shown in Figure 11, in the associated end wall 34. The lateral lid 70 is normally held in position to close the end opening 34a in the associated end wall 34 by the action of a coil or torsion spring 76 having its opposite ends engaged respectively to the end wall 34 and the lateral lid 70, a substantially intermediate coiled portion thereof being loosely mounted on the shaft 74 at a location between the bearing flanges 72.

While each of the lateral lids 70 is constructed and supported in the manner as hereinbefore described, it is to be noted that, when these lateral lids 70 are pivoted against the respective coil springs 76 to open the associated end openings 34a as shown in Figures 2, 5 and 9, they spread in the opposite directions with respect to each other in a plane generally perpendicular to the plane of each of the end openings 34a and also generally in parallel to the transverse bench 28 as best shown in Figures 5 and 12. For selectively opening and closing the lateral lids 70 simultaneously, a switching mechanism is utilized, which comprises a manipulatable slide knob 78 and a motion transmitter 80.

The motion transmitter 80 so far shown is of one-piece construction including a pair of elongated beams 82 connected together by a pair of spaced bridges 86, one of said elongated beams 82 having its substantially intermediate portion which is integrally formed with a connecting flange 83 for connection with the slide knob 78 in a manner described later. As best shown in Figure 10, each of the beams 82 has a pair of engagement projections, generally identified by 84, which projections 84 are integrally formed therewith and protrude therefrom in a direction at right angles to the respective beam 82. This motion transmitter 80 is accommodated with the generally flattened space between the transverse bench 28 and the cover plate 40 for movement in a direction towards and away from the cover plate 40 as best shown in Figures 4 and 5. It is to be noted that, with the motion transmitter 80 so accommodated movably, the projections 84 on the beams 82